

Measurement of Double Longitudinal Asymmetries for π^0 Production in Polarized pp Scattering at Low Bjorken- x

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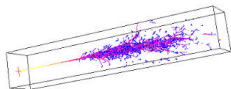
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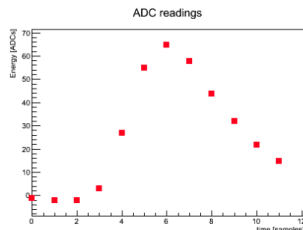


Pulse Shape Extraction in the MPC



The MPC measures photons from neutral pions. Avalanche Photodiodes (APDs) sample the integrated charge in the crystal as a function of time, thus providing information about the energy of the incoming photon.

The new MPC electronics are able to take 12 samples from these pulses, separated by 17.772 ns. This makes energy estimation much more accurate as energy is proportional to the integral over pulse amplitude.



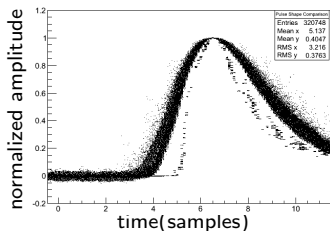
Goal: To extract for every channel and every type of pulse an average pulse shape that can be used to calculate the pulse's amplitude via fitting.

MPC Pulse Shape Extraction

General Strategy

The main idea behind pulse shape extraction is that two pulses of the same physics origin will have similar pulse shapes. The procedure to extract this shape is:

- 1 Obtain a large, clean sample of pulses of the same kind.
- 2 Estimate their amplitudes and t_0 . If there are no reference pulse shapes, use a spline fit.
- 3 Overlay these pulses on a two dimensional histogram.
- 4 Extract the mean pulse shape from this histogram.

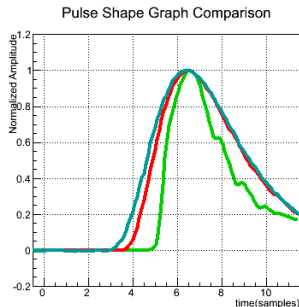
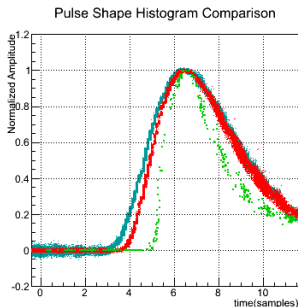


MPC Pulse Shape Extraction - Results

Property	Photonic	NP1(hadron showers)	NP2(APD inelastic)
Rise Time	~ 45 ns	~ 40 ns	~ 30 ns
Energy Range (ADC)	up to 800	up to a few thousand	>1500
E8/E9	0 - 1	0 - 1	< 0.01

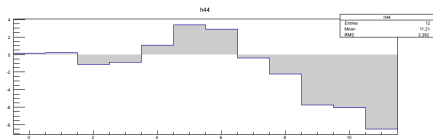
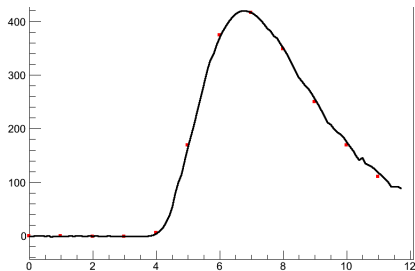
Table 1 : Characteristics of photonic and non photonic pulse shapes.

Channel 13: Turquoise represents the photonic shape, red is NP1 and green NP2

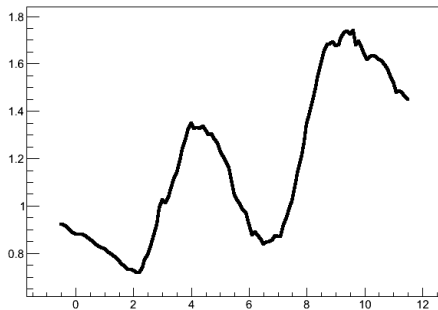


Energy estimation with the extracted pulse shapes

- The two fit parameters are amplitude and t shift
- Fit between 3 and 8.
- Errors are a function of time.



Complementary Error versus time



- Calibration

$$E = G \times C(\text{runNumber}) \times \text{ADC}$$

- Cluster A_{LL}

- Relative Luminosity